1. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-5 + 4i \text{ and } 4$$

A. $b \in [5, 14], c \in [-1, 5],$ and $d \in [-165, -162]$

B. $b \in [-2, 4], c \in [-1, 5],$ and $d \in [-22, -18]$

C. $b \in [-2, 4], c \in [-10, -7],$ and $d \in [11, 20]$

D. $b \in [-12, -3], c \in [-1, 5],$ and $d \in [164, 169]$

E. None of the above.

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2. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.
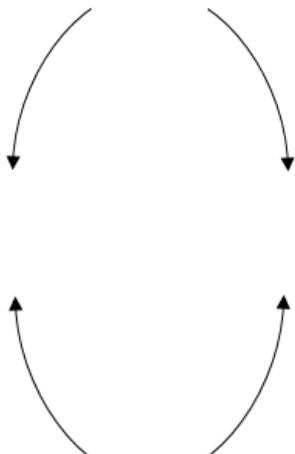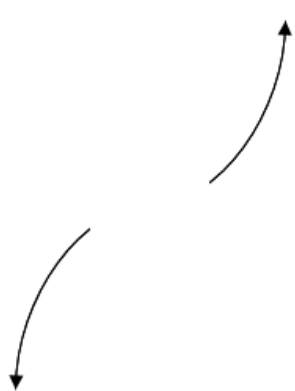
$$\frac{7}{4}, 5, \text{ and } \frac{7}{3}$$

A. $a \in [12, 14], b \in [-112, -107], c \in [293, 297],$ and $d \in [245, 252]$

B. $a \in [12, 14], b \in [-76, -65], c \in [-15, -8],$ and $d \in [245, 252]$

C. $a \in [12, 14], b \in [108, 115], c \in [293, 297],$ and $d \in [245, 252]$

D. $a \in [12, 14], b \in [-112, -107], c \in [293, 297],$ and $d \in [-246, -240]$

E. $a \in [12, 14], b \in [49, 58], c \in [-88, -83],$ and $d \in [-246, -240]$

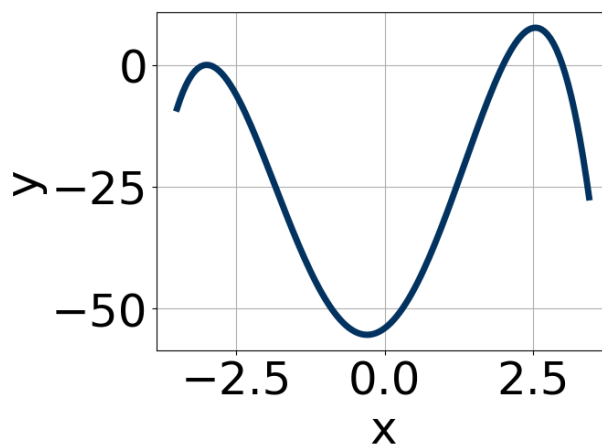3. Describe the end behavior of the polynomial below.

$$f(x) = -5(x + 3)^4(x - 3)^5(x + 2)^3(x - 2)^5$$

B.

D.

C.

E. None of the above.

4. Which of the following equations *could* be of the graph presented below?

A. $18(x+3)^{10}(x-3)^9(x-2)^7$

B. $-5(x+3)^6(x-3)^5(x-2)^9$

C. $4(x+3)^4(x-3)^9(x-2)^4$

D. $-16(x+3)^5(x-3)^8(x-2)^7$

E. $-13(x+3)^{10}(x-3)^8(x-2)^{11}$

---

5. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{-1}{2}, \frac{5}{4}, \text{ and } \frac{7}{5}$$

A. $a \in [35, 45], b \in [-86, -81], c \in [16, 18],$ and $d \in [32, 42]$

B. $a \in [35, 45], b \in [-128, -124], c \in [121, 126],$ and $d \in [-38, -33]$

C. $a \in [35, 45], b \in [-33, -17], c \in [-75, -64],$ and $d \in [32, 42]$

D. $a \in [35, 45], b \in [-86, -81], c \in [16, 18],$ and $d \in [-38, -33]$

E. $a \in [35, 45], b \in [81, 94], c \in [16, 18],$ and $d \in [-38, -33]$
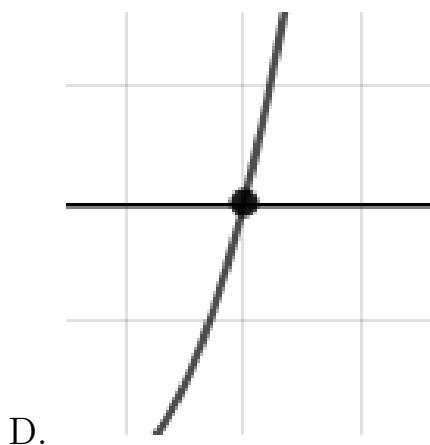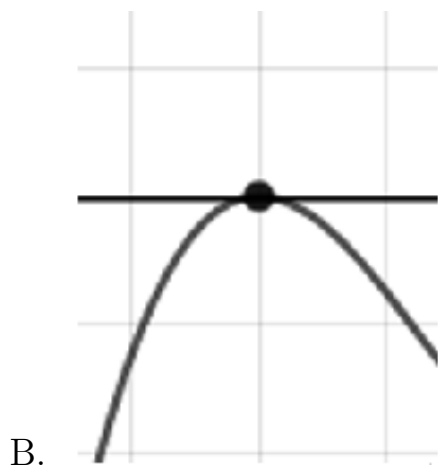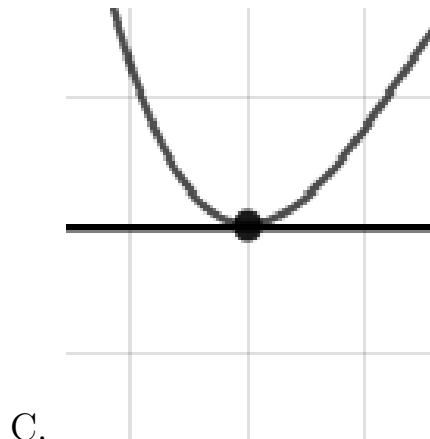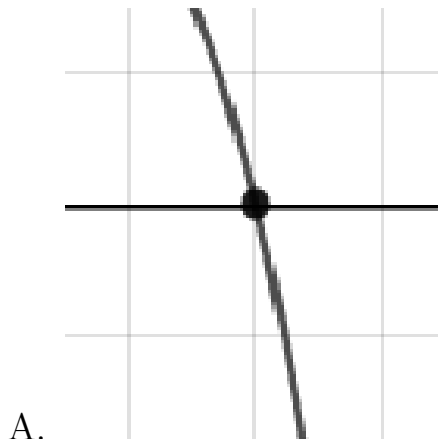
6. Which of the following equations *could* be of the graph presented below?
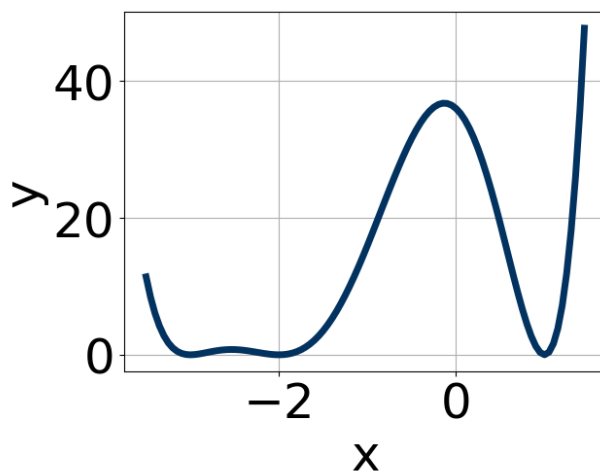
A. $8(x + 2)^8(x + 3)^6(x - 1)^6$

B. $-12(x + 2)^4(x + 3)^8(x - 1)^{10}$

C. $10(x + 2)^6(x + 3)^6(x - 1)^5$

D. $-13(x + 2)^{10}(x + 3)^8(x - 1)^9$

E. $19(x + 2)^{10}(x + 3)^{11}(x - 1)^9$

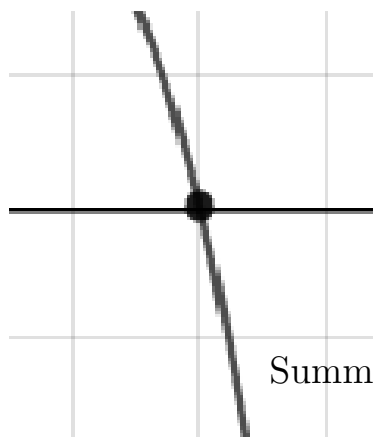7. Describe the zero behavior of the zero $x = 3$ of the polynomial below.

$$f(x) = -2(x-2)^6(x+2)^3(x+3)^{11}(x-3)^6$$

A.

C.

B.

D.

E. None of the above.

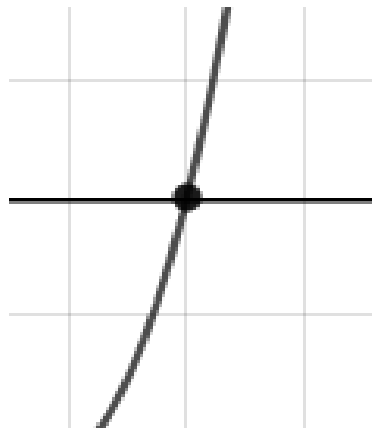8. Describe the zero behavior of the zero $x = 2$ of the polynomial below.

$$f(x) = -2(x-2)^2(x+2)^7(x+9)^4(x-9)^8$$
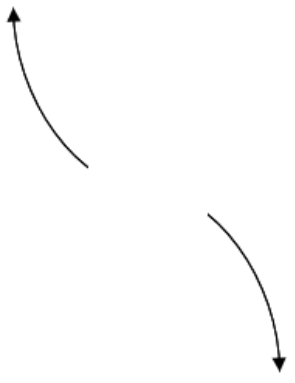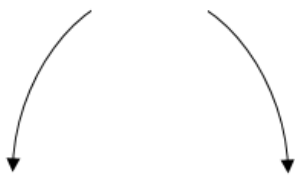
A.

B.

C.

D.

E. None of the above.

9. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-2 + 2i \text{ and } 1$$

A. $b \in [-3.8, -1.5], c \in [2.1, 5.2],$ and $d \in [6.4, 9.3]$

B. $b \in [0.7, 2.7], c \in [-3.6, -0.8],$ and $d \in [0.3, 4.3]$

C. $b \in [2, 4.5], c \in [2.1, 5.2],$ and $d \in [-8.4, -7.4]$

D. $b \in [0.7, 2.7], c \in [-0.3, 2.5],$ and $d \in [-4.2, -1.1]$

E. None of the above.

10. Describe the end behavior of the polynomial below.

$$f(x) = 6(x+3)^3(x-3)^6(x-2)^5(x+2)^6$$
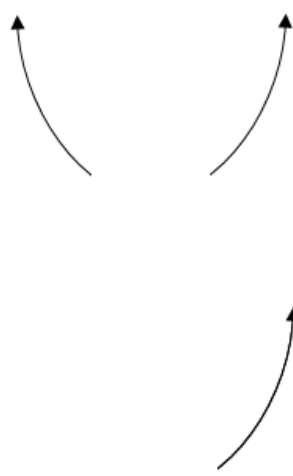
A.

B.

C.

D.

E. None of the above.

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11. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$-5 + 4i \text{ and } 1$$

A. $b \in [7, 12], c \in [31, 38],$ and $d \in [-48, -38]$

B. $b \in [0, 5], c \in [-2, 10],$ and $d \in [-10, -2]$

C. $b \in [-10, -7], c \in [31, 38],$ and $d \in [35, 42]$

D. $b \in [0, 5], c \in [-7, 0],$ and $d \in [2, 5]$

E. None of the above.

12. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.
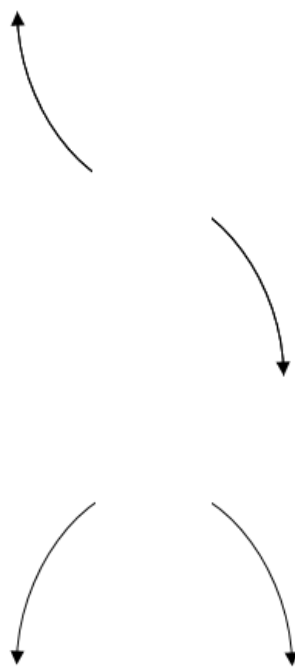
$$\frac{-7}{3}, \frac{-3}{2}, \text{ and } -1$$

A. $a \in [0, 8], b \in [-18, -13], c \in [-7, -1],$ and $d \in [20, 27]$

B. $a \in [0, 8], b \in [-31, -26], c \in [43, 48],$ and $d \in [-21, -18]$

C. $a \in [0, 8], b \in [-2, 12], c \in [-29, -22],$ and $d \in [-21, -18]$

D. $a \in [0, 8], b \in [26, 34], c \in [43, 48],$ and $d \in [-21, -18]$

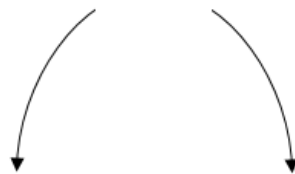E. $a \in [0, 8], b \in [26, 34], c \in [43, 48],$ and $d \in [20, 27]$

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13. Describe the end behavior of the polynomial below.

$$f(x) = 8(x + 3)^5(x - 3)^{10}(x + 9)^2(x - 9)^3$$
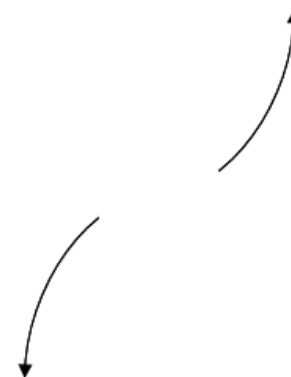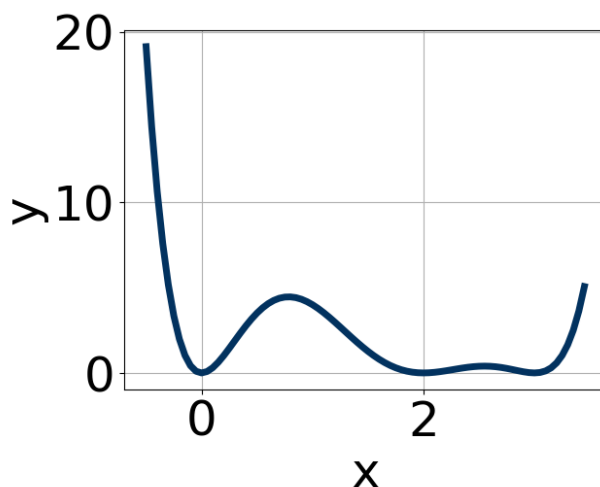

A.

B.

C.

D.

E. None of the above.

---

14. Which of the following equations *could* be of the graph presented below?

A. $-6x^{10}(x-3)^8(x-2)^{11}$

B. $-12x^8(x-3)^{10}(x-2)^{10}$

C. $20x^8(x-3)^4(x-2)^6$

D. $19x^{10}(x-3)^{10}(x-2)^5$
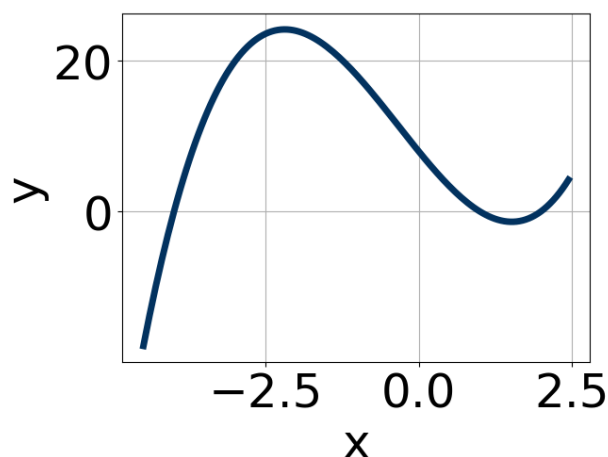
E. $17x^7(x-3)^8(x-2)^7$

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15. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{-3}{4}, 4, \text{ and } \frac{4}{3}$$

A. $a \in [6, 19], b \in [54, 56], c \in [13, 20], \text{ and } d \in [-52, -44]$

B. $a \in [6, 19], b \in [-58, -53], c \in [13, 20], \text{ and } d \in [-52, -44]$

C. $a \in [6, 19], b \in [-58, -53], c \in [13, 20], \text{ and } d \in [47, 52]$

D. $a \in [6, 19], b \in [22, 29], c \in [-90, -84], \text{ and } d \in [47, 52]$

E. $a \in [6, 19], b \in [-77, -65], c \in [111, 121], \text{ and } d \in [-52, -44]$

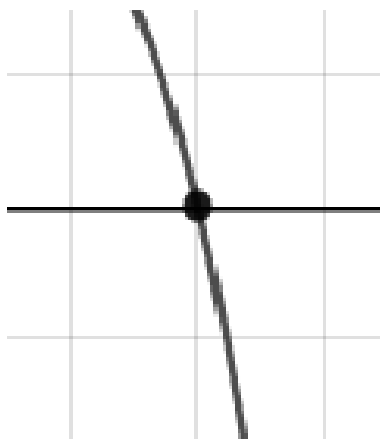16. Which of the following equations *could* be of the graph presented below?

A. $-7(x-1)^8(x-2)^7(x+4)^{11}$

B. $-17(x-1)^5(x-2)^9(x+4)^9$

C. $11(x-1)^7(x-2)^9(x+4)^7$

D. $20(x-1)^{10}(x-2)^8(x+4)^{11}$

E. $18(x-1)^6(x-2)^{11}(x+4)^5$

---

17. Describe the zero behavior of the zero $x = -4$ of the polynomial below.

$$f(x) = 4(x+4)^8(x-4)^{13}(x-8)^2(x+8)^6$$

A.
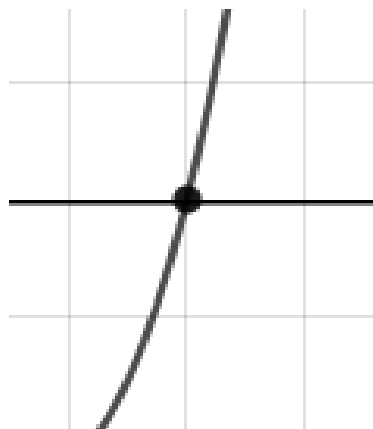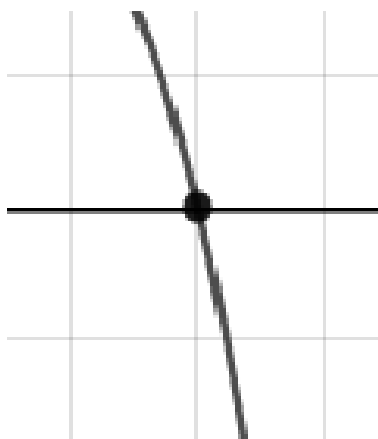

B.

C.

D.

E. None of the above.

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18. Describe the zero behavior of the zero $x = -6$ of the polynomial below.

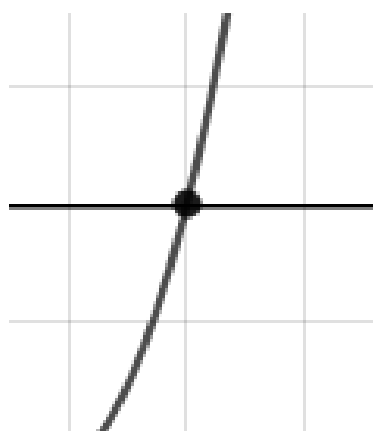$$f(x) = -4(x-8)^{12}(x+8)^8(x+6)^{11}(x-6)^8$$

A.

C.

B.

D.

E. None of the above.

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19. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.
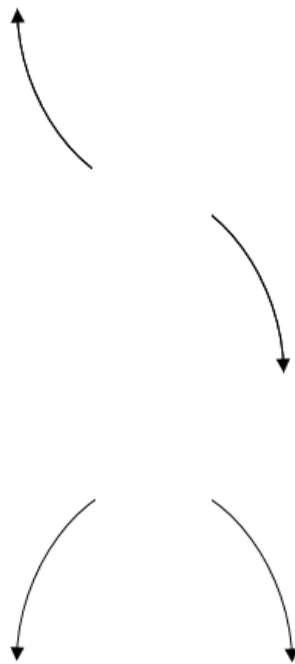
$$-5 + 4i \text{ and } 4$$

A. $b \in [-7.2, -3.1], c \in [-6, 9], \text{ and } d \in [157, 173]$

B. $b \in [-1.8, 4.3], c \in [-6, 9], \text{ and } d \in [-26, -16]$

C. $b \in [-1.8, 4.3], c \in [-10, -5], \text{ and } d \in [16, 23]$

D. $b \in [5.4, 7.5], c \in [-6, 9], \text{ and } d \in [-165, -163]$
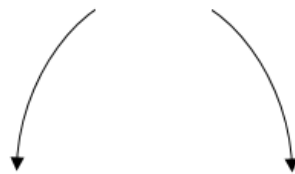
E. None of the above.

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20. Describe the end behavior of the polynomial below.

$$f(x) = 4(x - 9)^3(x + 9)^8(x - 8)^4(x + 8)^4$$

A.

B.

C.

D.

E. None of the above.

21. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.

$$4 - 2i \text{ and } -4$$

A. $b \in [2.8, 5.1], c \in [-12, -11]$, and $d \in [-87, -78]$

B. $b \in [-7.8, -3.5], c \in [-12, -11]$, and $d \in [78, 84]$

C. $b \in [-0.6, 1.1], c \in [3, 7]$, and $d \in [3, 9]$

D. $b \in [-0.6, 1.1], c \in [0, 5]$, and $d \in [-20, -13]$
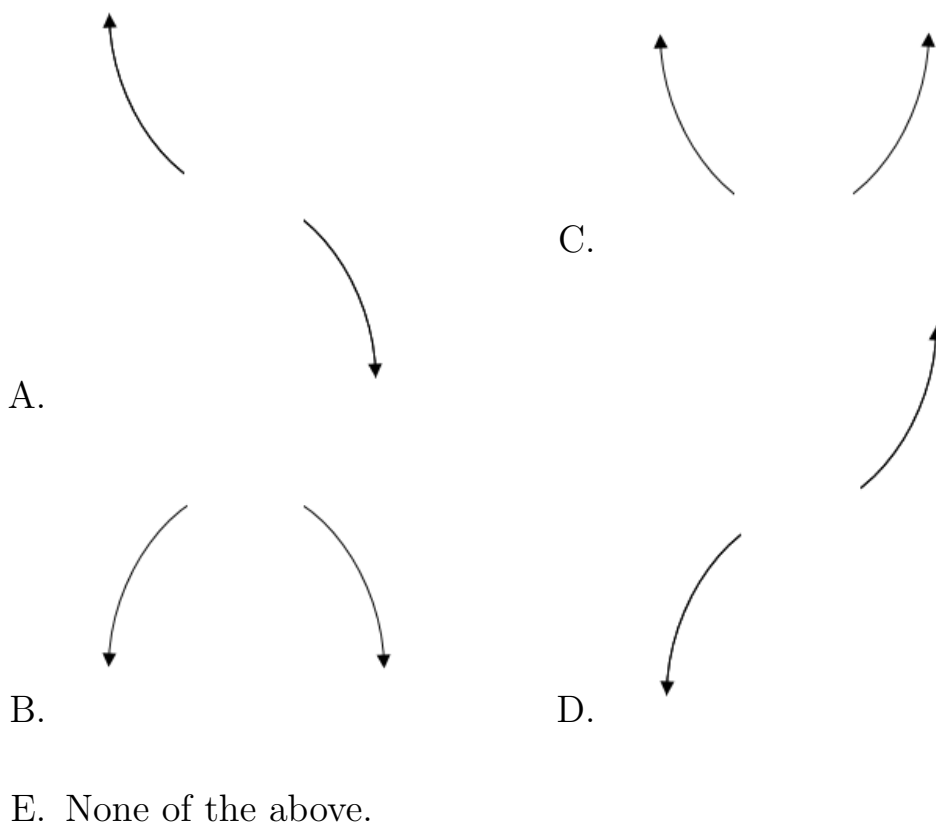
E. None of the above.

22. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.
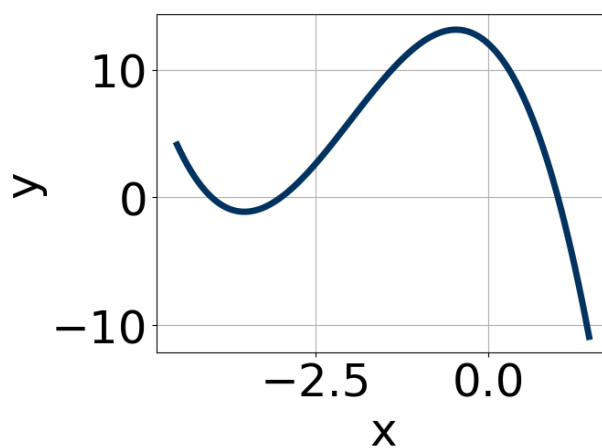
$$-6, \frac{1}{3}, \text{ and } \frac{-3}{2}$$

A. $a \in [6, 12], b \in [-25.3, -24.5], c \in [-64, -61]$, and $d \in [-24, -15]$

B. $a \in [6, 12], b \in [40.1, 45.7], c \in [33, 40]$, and $d \in [-24, -15]$

C. $a \in [6, 12], b \in [-30.7, -26], c \in [-53, -38]$, and $d \in [11, 26]$

D. $a \in [6, 12], b \in [-44.1, -41], c \in [33, 40]$, and $d \in [11, 26]$

E. $a \in [6, 12], b \in [40.1, 45.7], c \in [33, 40]$, and $d \in [11, 26]$

23. Describe the end behavior of the polynomial below.

$$f(x) = -6(x + 7)^5(x - 7)^{10}(x - 8)^3(x + 8)^3$$

C.

A.

B.   D.

E. None of the above.

24. Which of the following equations *could* be of the graph presented below?

A. $-10(x+3)^{10}(x-1)^{11}(x+4)^9$

B. $9(x+3)^{10}(x-1)^5(x+4)^5$

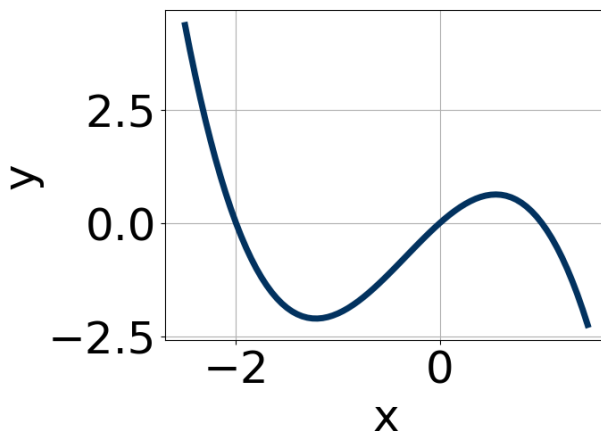C. $16(x+3)^7(x-1)^7(x+4)^5$

D. $-17(x+3)^{10}(x-1)^6(x+4)^{11}$

E. $-13(x+3)^9(x-1)^7(x+4)^5$

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25. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $ax^3 + bx^2 + cx + d$.

$$\frac{1}{4}, \frac{7}{4}, \text{ and } \frac{-2}{3}$$

A. $a \in [45, 50], b \in [123, 130], c \in [83, 89], \text{ and } d \in [12, 19]$

B. $a \in [45, 50], b \in [-41, -33], c \in [-70, -66], \text{ and } d \in [-20, -13]$

C. $a \in [45, 50], b \in [-66, -60], c \in [-43, -33], \text{ and } d \in [12, 19]$

D. $a \in [45, 50], b \in [-66, -60], c \in [-43, -33], \text{ and } d \in [-20, -13]$

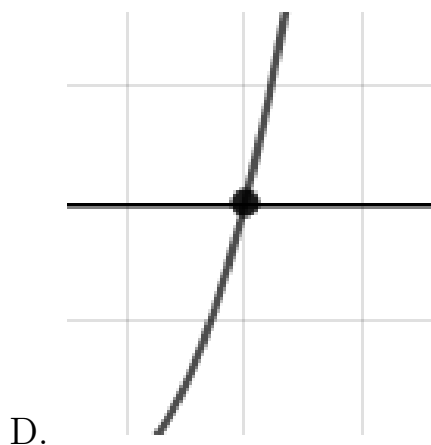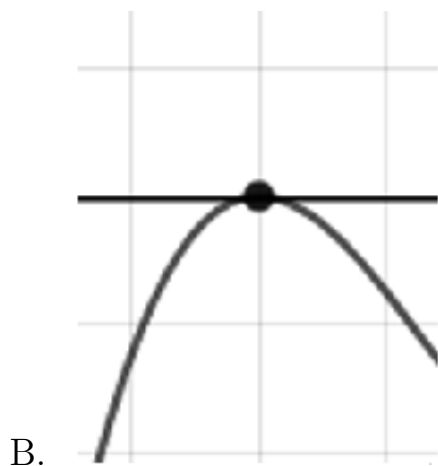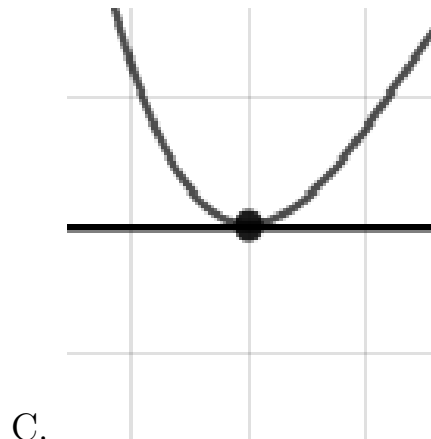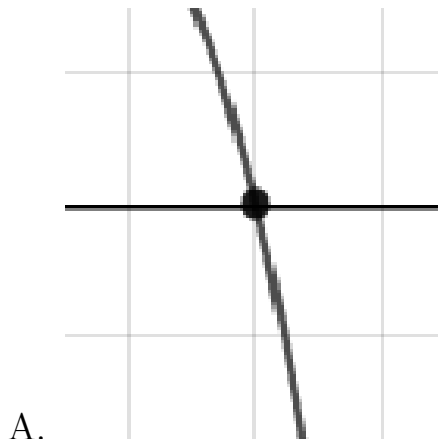E. $a \in [45, 50], b \in [64, 70], c \in [-43, -33], \text{ and } d \in [-20, -13]$

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26. Which of the following equations *could* be of the graph presented below?

A. $11x^9(x+2)^6(x-1)^5$

B. $11x^{11}(x+2)^5(x-1)^5$

C. $-12x^5(x+2)^5(x-1)^9$

D. $-6x^7(x+2)^{10}(x-1)^7$

E. $-9x^6(x+2)^4(x-1)^7$

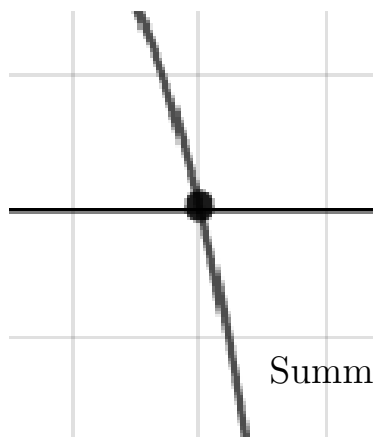27. Describe the zero behavior of the zero $x = -8$ of the polynomial below.

$$f(x) = 3(x + 2)^5(x - 2)^2(x + 8)^7(x - 8)^2$$
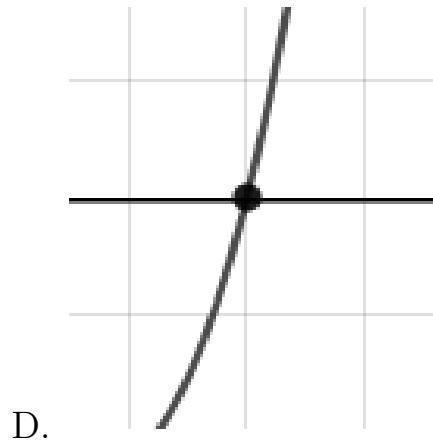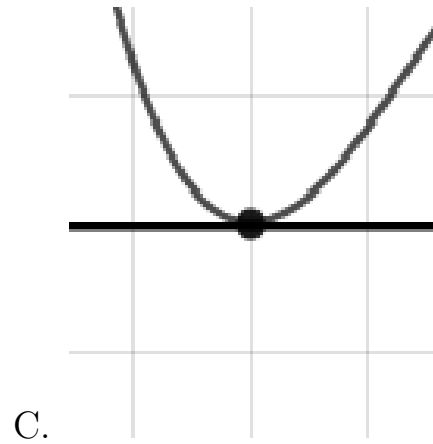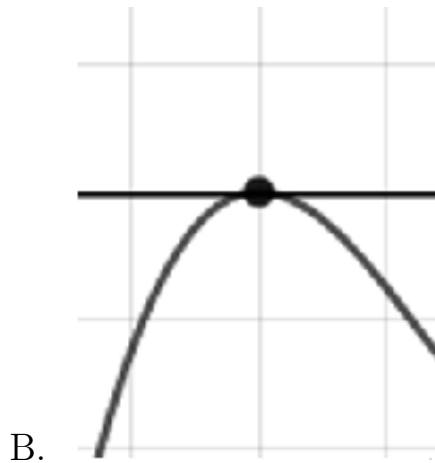
A.

C.

B.

D.

E. None of the above.

28. Describe the zero behavior of the zero $x = -5$ of the polynomial below.

$$f(x) = 7(x - 5)^2(x + 5)^5(x + 9)^8(x - 9)^{11}$$

A.

B.

C.

D.

E. None of the above.

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29. Construct the lowest-degree polynomial given the zeros below. Then, choose the intervals that contain the coefficients of the polynomial in the form $x^3 + bx^2 + cx + d$.
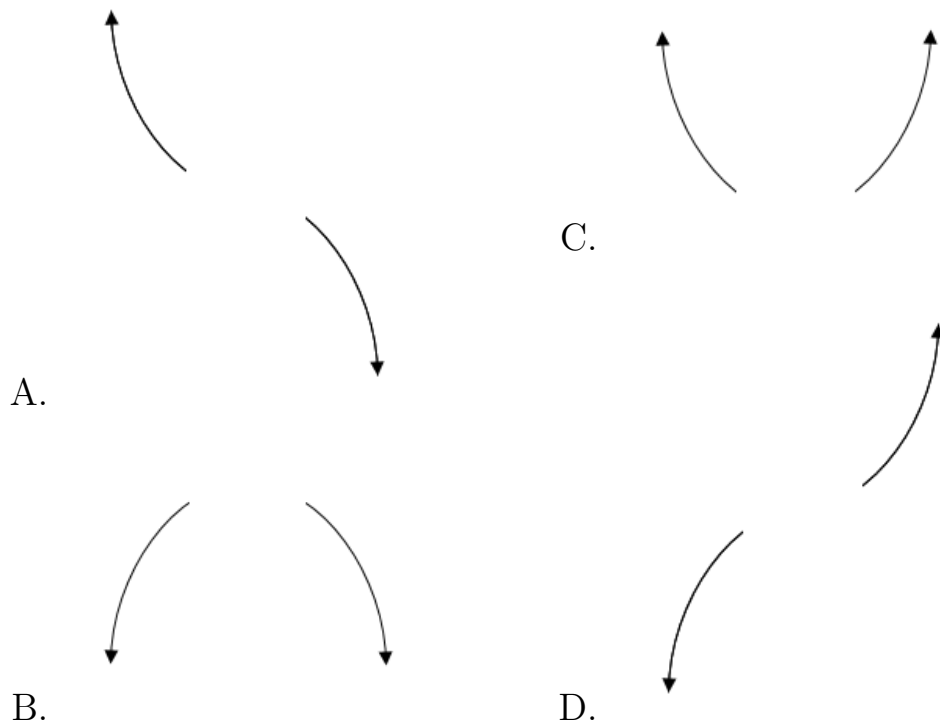
$$-4 + 3i \text{ and } 3$$

A. $b \in [-0.5, 2], c \in [-15, -4],$ and $d \in [7, 12]$

B. $b \in [3.6, 8.1], c \in [0, 5],$ and $d \in [-77, -74]$

C. $b \in [-5.2, 0.5], c \in [0, 5],$ and $d \in [70, 77]$

D. $b \in [-0.5, 2], c \in [0, 5],$ and $d \in [-14, -5]$

E. None of the above.

30. Describe the end behavior of the polynomial below.

$$f(x) = 5(x - 6)^2(x + 6)^3(x + 3)^5(x - 3)^7$$

A.

B.

C.

D.

E. None of the above.